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Wisdom to make a difference.

Sharing Lab Ventilation Lessons Learned

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November, 2017

The Project

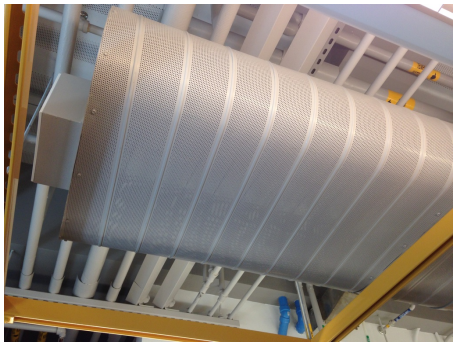
- Retro-commissioning of university engineering building - 60k SF
  - Designed mid-1990s / built 2005
  - Wide range of chemical uses
- Operating costs/square foot were 2.5 times average
- Occupant complaints of temps and airflow had led to controls changes and partial covering of supply diffusers

Laboratory Architecture

Wall with hoods

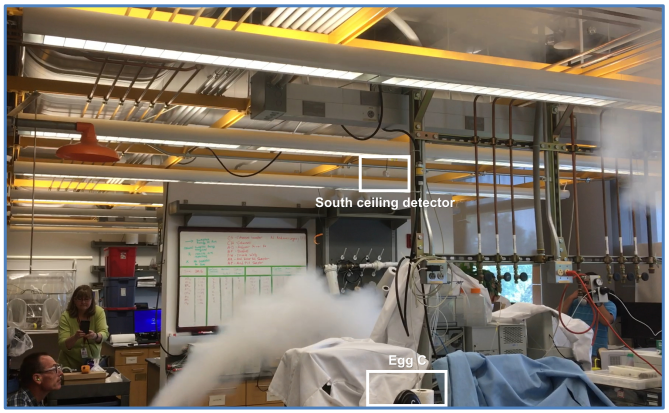
Virtual ceiling

Low velocity supply diffusers

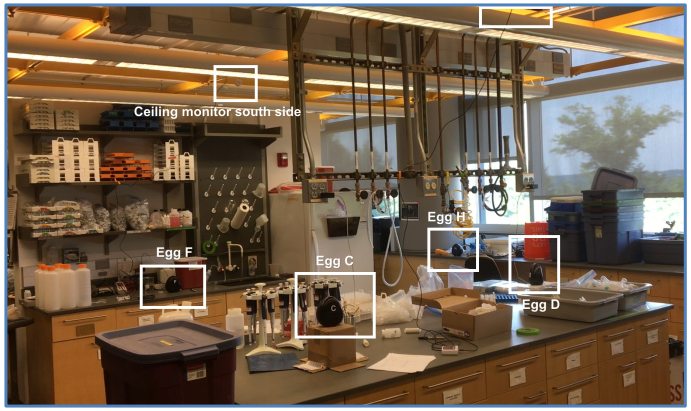


Partial wall between bays

CO2 Release from a Fire Extinguisher



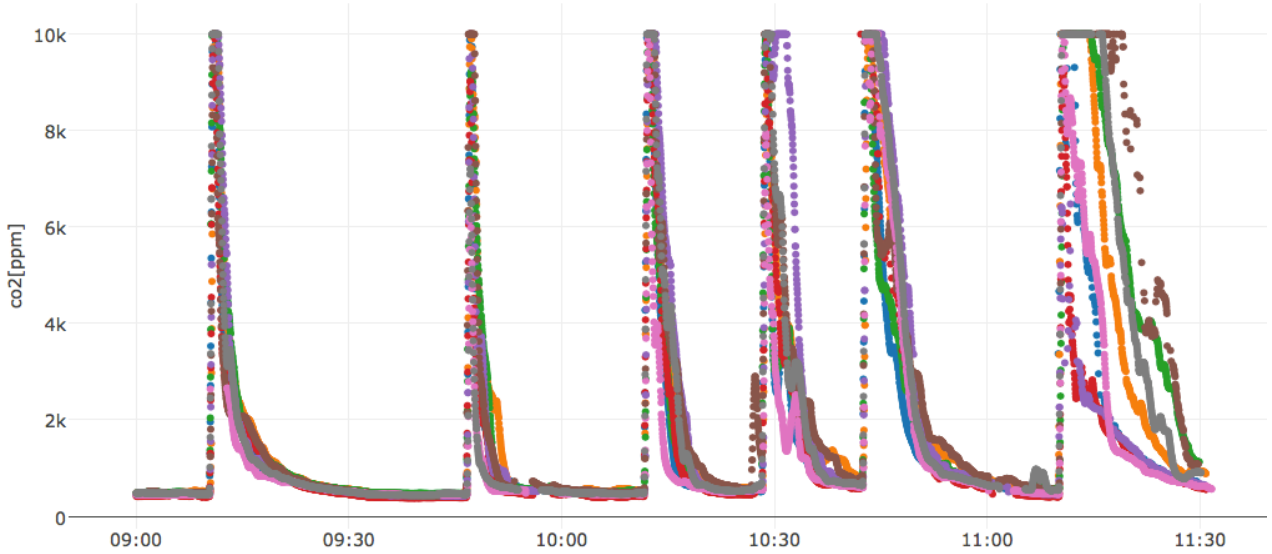
Locations of CO2 Sensors



Acetone “Spill”

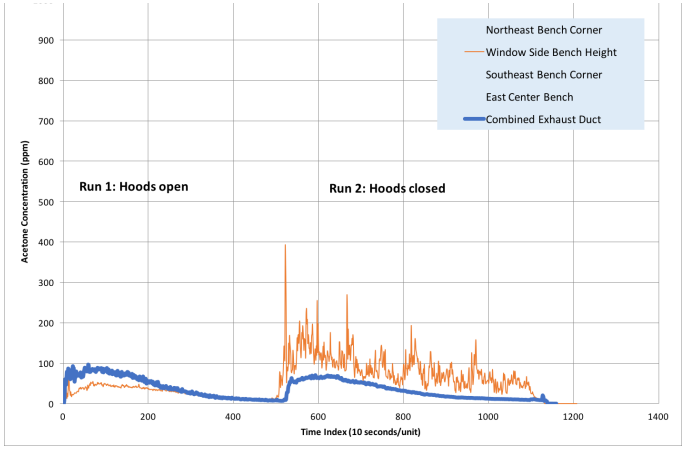
Fog Release

CO2 Data, by Time and Location

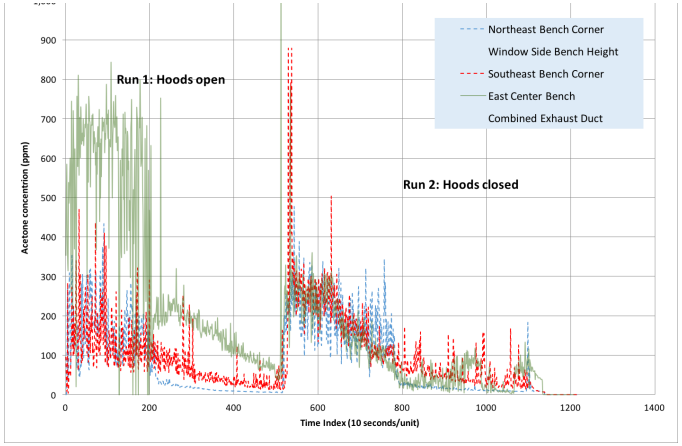


- Six releases to represent different scenarios over the course of 7 hours of work, including set up and shut down.
- Material cost about $500; instrumentation cost about $7000

Acetone Data, by Time and Location

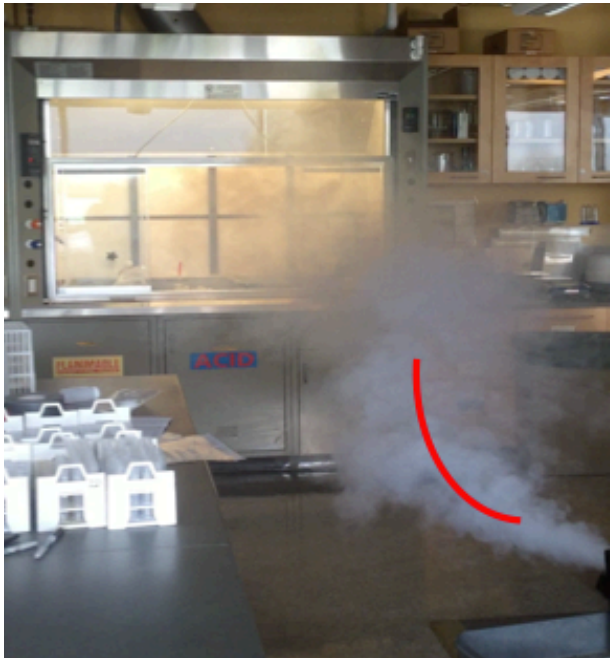


- Window Wall Bench and Combined Exhaust Duct



- East Side Points and
  - Center Bench

Smoke Visualization



Before Rebalancing

After Rebalancing

Lesson 3: Occupant Communications

As airflows are lowered, remind users abuot:

- The impact of good chemical storage practices
- To consult EHS for risk assessment when processes/materials change significantly
- Laboratory HVAC is not a Do It Yourself project

American Chemical Society

ACS Laboratory Safety Course

Introduction to Laboratory Ventilation

Created and managed by:

- ACS Division of Chemical Health and Safety
- ACS Committee on Chemical Safety
- ACS Board Committee on Corporation Associates

ACS Chemistry for Life®

Objectives

1. Identify the elements of the laboratory ventilation system, including *chemical fume hoods, general lab ventilation* and *chemical storage cabinets.*
2. Understand the *key user practices* that maintain containment in the chemical fume hood.
3. Appreciate the importance of managing *chemical storage* in maintaining a safe lab.
4. Recognize the impact of *operating costs* on lab protection strategies.
5. Know when consultation with *building managers* is necessary to adjust ventilation in order to maintain a safe lab.

FAQ 4:
Aren't all lab hoods the same?

While laboratory hoods tend to look the same, they have distinct functions. The two most important types are:

- *Chemical fume hoods* dilute volatile **chemicals** to reduce their hazard to acceptable levels when they are exhausted from the building. However, there are many variations on this concept. In general, these hoods *protect the worker from chemicals*. For example, some chemical hoods also include *wash down systems* to address acid contamination; these are unusual on most campuses.
- *Biological safety cabinets* use HEPA filters to collect **particles** out of the air they are moving; these filters do not control gasses at all. *They protect the worker from particles and the work area from the lab environment, including the worker*. You can review a video from NIH to understand how to best use a biosafety cabinet to protect yourself and your science.

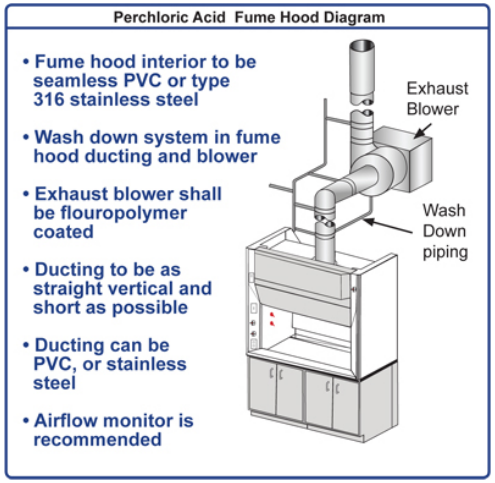
chemical fume hood

Biosafety cabinet

FAQ 5:
How many different kinds of chemical fume hoods are there?

In addition to general purpose chemical fume hoods, there are specialized hoods designed for specific lab needs. Examples of such hoods include:

- *Perchloric acid hoods* that have wash-down systems to remove perchlorate salts from the hood's ductwork.
- *Vented work benches* are designed to capture specific chemicals from consistent processes.
- *Radioisotope hoods* include HEPA filters in the airstream to capture radioactive particles before they are released to the outdoor environment.



FAQ 6:
Why does that hood alarm keep going off?

- Most hoods include *alarm systems* that attempt to identify situations in which the hood is likely to *lose control of the contaminants* in them.
- However, some hoods have alarms which attempt to identify conditions which indicate excessive use of ventilation energy.
- *There is no single system of alarm signals that apply to all laboratory hoods.*
- For this reason, it is important to *seek assistance when a hood alarm sounds* to determine the cause of the alarm. This assistance may come from the lab building manager, the laboratory supervisor, or a neighboring lab worker.

Various styles of fume hood monitors

FAQ 6, part 2: Why does that hood alarm keep going off?

- Most hood alarms measure the *face velocity* of air entering the hood. If the face velocity goes below a specific speed (*usually between 60 and 80 feet per minute or 0.6 and 0.8 mph*), the alarm will sound. This alarm is intended to alert the hood's user to **the possibility of a loss of containment**.
- Often, these problems are transient and resolve themselves within minutes. Other times, these alarms indicate problems that require *adjustments to the system.*
- For this reason, *hood alarms should be investigated* beyond silencing the alarm. The sooner that the facility operators are alerted to the problem, the sooner the problem can be fixed.